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Site Holdup Measurement Plan

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Measurement Plan for Holdup Characterization of Building 771

SAFEGUARDS MEASUREMENTS
SAFEGUARDS AND ACCOUNTABILITY
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

Approved By: 

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SW-A -002864

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Revision 1, April 6, 1998

1. PURPOSE

The purpose of this plan is to give written guidance for holdup characterization of Building 771 at the Rocky Flats Environmental Technology Site. The plan is intended to supply general guidance for completing characterization including isotopic identification and quantification of fissile material holdup in this building. An overview of the steps planned to complete this task is included.

2. SCOPE

This plan will be used for Safeguards Measurements Holdup Team members to supplement Rocky Flats Environmental Technology Site Procedure 4-X60-SMP-3001, Quantification of Holdup. The task of completing holdup characterization consists of determining elements and amounts of Special Nuclear Material holdup in all areas of the Building 771 MAA that are expected to contain holdup. Locations characterized will include all gloveboxes and hoods and all equipment in the gloveboxes and hoods, the pneumatic transfer system, and all tanks and pipes not requiring tap and drain activities on September 1, 1998.

Following this task, but not included in the scope for fiscal year 1998, is the determination of the Safeguards category of the holdup material. A subsequent step, again not included in the FY98 scope, is the removal of in-process material, holdup requiring removal, stored materials, solutions, and product. Additional measurements will be required to quantify remaining holdup in areas requiring remediation and pipes and tanks involved in the tap and drain process. When MAA evaluation is requested, a "wall-to-wall" scan of the MAA will be performed to demonstrate that holdup is not in unexpected areas. This "wall-to-wall" scan is required as part of verifying the MAA inventory total for Safeguards and Accountability categorization.

3. INTRODUCTION

Holdup is defined as "the amount of nuclear material remaining in process equipment and facilities after the in-process material, stored materials, and product have been removed."¹ In 1997, 51 high holdup locations were measured in Building 771 to quantify significant holdup inventory without completing the level of effort required for deactivation support. Glovebox and equipment locations were selected using several criteria. Attribute scan results (1995) were examined and high scan result locations were selected. Knowledgeable personnel within and outside our organization were consulted, and video characterization was examined.

Measurement results for the 51 locations indicated an average of approximately 660 grams of plutonium holdup per location. The results of this measurement campaign more than doubled the amount of holdup inventory identified in Building 771. Measurements of the most likely areas have been completed. Measurements of the remaining locations where holdup material is expected are needed as soon as stored material is removed.

¹ *Safeguards and Security Glossary of Terms*, U. S. Department of Energy, Office of Safeguards and Security, Office of Security Affairs, December 18, 1995, page 68.

Measurement Plan for Holdup Characterization of Building 771

Revision 1, April 6, 1998

4. COMPLETE CHARACTERIZATION OF HOLDUP

Building 771 is scheduled for complete characterization measurements in fiscal year 1998. These measurements will be limited to the Building 771 Material Access Area (MAA). Complete characterization will include all areas of likely holdup accumulation. Holdup accumulation can occur at any location where fissile material has been processed or handled. The term 'process holdup' can be misleading because areas such as transfer lines and conveyors are not directly part of processing but potentially contain holdup. Holdup can be found in many locations including the following: ducts, pipes, heat chambers, tanks, gloveboxes, storage areas, pumps, and filters.

A room by room evaluation of processing operations in Building 771 has been performed.² This included past operations and locations of stored material as well as observations of cleanliness and equipment locations. Fissile materials were processed in the following rooms in Building 771: 140B 146, 146A, , 147C, 147D, 147E, 147F, 149, 149A, 149B, 149C, 114, 114A, 114B, 112, 148, 141, 172, 174, 176, 178, 179, 179A, 180A, 180B, 180C, 180D, 180E, 180L, 180G, 180H, 180I, 180K, 181C, 182, 182A, 183A, 184, 185, and on the second floor. All systems, except pipes and tanks requiring tap and drain activities after September 1, 1998, where fissile material was processed will be scanned unless measurements have been performed since operations in the room were terminated. The measured values for the items scanned will be evaluated on the basis of a statistical decision level (background at the location + 2.33 times the square root of the background measurement). Items where the decision level does not indicate activity will be documented. Items for which the decision level indicates activity will be measured and quantified or reported as below a calculated lower limit of detection (LLD).

Holdup results will be reported to the following: Closure Project Manager, Safeguards and Accountability Manager, and Criticality Safety Representative. Results will also be updated on the Safeguards Accountability Network (SAN) monthly. Results will be maintained as quality records in Room 107 of Building 750 and will be available on request.

5. PROCEDURE

The measurement campaign will employ procedure 4-X60-SMP-3001, Quantification of Holdup. All measurement control and calibration requirements of this procedure will be followed and documented. Specific additional steps used for this task may include:

- Perform high purity germanium (HPGe) high resolution assays for isotopic characterization with the detector positioned to include significant holdup in the detector field of view (FOV). For large items several measurements may be required. For other items such as tanks, one HPGe assay may be adequate.
- When permitted by Radiological Work Permit (RWP), perform for each glovebox at least one measurement through the leaded glove with tungsten shield on the opposite side of glovebox to estimate the amount of holdup on the glove surfaces.

Glovebox measurements for completion of characterization are to be accomplished only when all packaged fissile material has been removed. Gloveboxes used for material storage will not be measured until the material has been evaluated or removed. Measurements of nearby

² SNM CONSOLIDATION RELATED TO BUILDING 771 - CEB-117-96, C. E. Baldwin, September 30, 1996.

Measurement Plan for Holdup Characterization of Building 771

Revision 1, April 6, 1998

gloveboxes may also be delayed until the material has been removed to reduce elevated background levels. To make the most efficient use of time, measurement teams should remain in one area of the building until all holdup measurements are completed or they are requested to leave that area. Deployment of measurement teams will be coordinated with the 771 Project schedule.

All measurement sites may require two types of measurements. One type of measurement is accomplished with Hyper-Pure Germanium (HPGe) detectors that have a current calibration. High resolution spectra will be acquired for an energy range from 50 to 600 keV. This measurement will be used where isotopic determination is indicated. If quantification of isotopes other than ^{239}Pu is indicated, additional HPGe measurements will be performed. If no count rate above background is detected, HPGe measurements are not required. These measurements may replace Bismuth Germinate Oxide (BGO) measurements. No attempt will be made to quantify depleted uranium. These systems will also be used to evaluate difficult attenuation corrections. The second measurement type will be accomplished with a BGO low resolution gamma ray detection system calibrated to quantify grams of plutonium per unit area. The BGO detector will be used to measure multiple locations and the results will be summed to quantify total holdup. The BGO detector will also be used to scan to determine areas not requiring quantification assays. All measurements and locations will be mapped and the results will be recorded for each of the measurement points.

6. ASSUMPTIONS

Completion of holdup characterization of Building 771 requires completion of several prerequisite actions: (1) Drums must, as a minimum, be removed from the room in which holdup quantification is to be performed and (2) Fissile material items must be removed from gloveboxes remaining to be measured., Building support similar to completion of the 51 high holdup locations will be required.

7. DELIVERABLES

Completion of holdup characterization of Building 771 can be divided into several deliverables. These consist of the following: (1) quantification of holdup in all gloveboxes (202 identified on attached list), (2) quantification of holdup in pneumatic and miscellaneous systems, (3) quantification of holdup in all empty tanks, and (4) quantification of holdup in drain line systems not requiring tap and drain activities. Completion of each deliverable will be documented by correspondence with a spreadsheet list of holdup and the associated measurement uncertainty. Verification of completion may be required by the appropriate Building 771 Subject Matter Expert (SME).

A suggested estimate of the portion of effort for each sub task follows:

(1) Gloveboxes	70%
(2) Pneumatic and miscellaneous systems	10%
(3) Remaining empty tanks	10%
(4) Drain lines not requiring draining	10%